

NAVAL POSTGRADUATE SCHOOL Monterey, California



FACTORS THAT CREATE LEARNER ENGAGEMENT IN NETWORK-BASED INSTRUCTION

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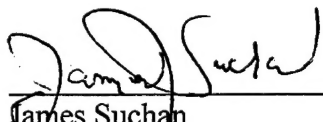
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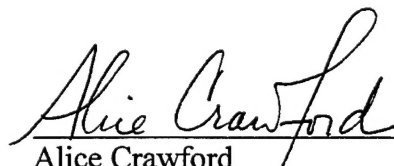
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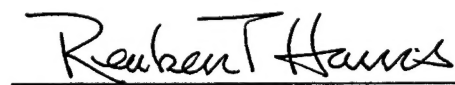
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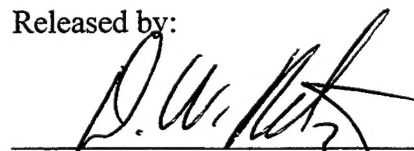

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ABSTRACT

This research analyzes the design characteristics and organizational systems factors that should be addressed by program managers in the Navy Bureau of Medicine and Surgery (BUMED) for the development of network-based instruction (NBI). BUMED's development of NBI modules for Medical Department executives represents a radical departure from the form and context of graduate education that these busy professions have experienced in the past. Design characteristics and systems factors must be addressed to ensure that NBI implementation is handled strategically. Many other innovations in instructional technology have failed because they have not considered the fit between the technology and the learners, tasks, and the organization. These factors should be addressed initially in the design of instruction, and ultimately in beta testing. Recommendations of this research focus on those actions that NBI subject matter experts and systems designers can take to ensure that executives are fully engaged in the learning experience. As a result, they will complete the NBI courses, perceive them as valuable, and acquire knowledge, skills, and abilities that will contribute to enhanced job performance.

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INTRODUCTION

This report addresses the implementation of network-based instruction (NBI), a form of distance learning designed to provide senior Navy medical executives with management education. To determine ways to make the NBI learning experience effective, the report analyzes characteristics of NBI instructional design that can help motivate busy executives to fully participate in the learning tasks and the Navy Bureau of Medicine and Surgery (BUMED) organizational system in which NBI education takes place. We define one crucial aspect of NBI effectiveness as the executive's engagement or immersion in the learning experience. More specifically, effectiveness is the executive's motivation to be fully involved with the instruction, to extract every benefit possible from the experience, and to interact with the technology, other learners, and the subject matter expert so as to increase the possibility of executives' attaining desired learning outcomes. High levels of learner engagement in NBI Executive Management Education (EME) modules should result in improved job performance.

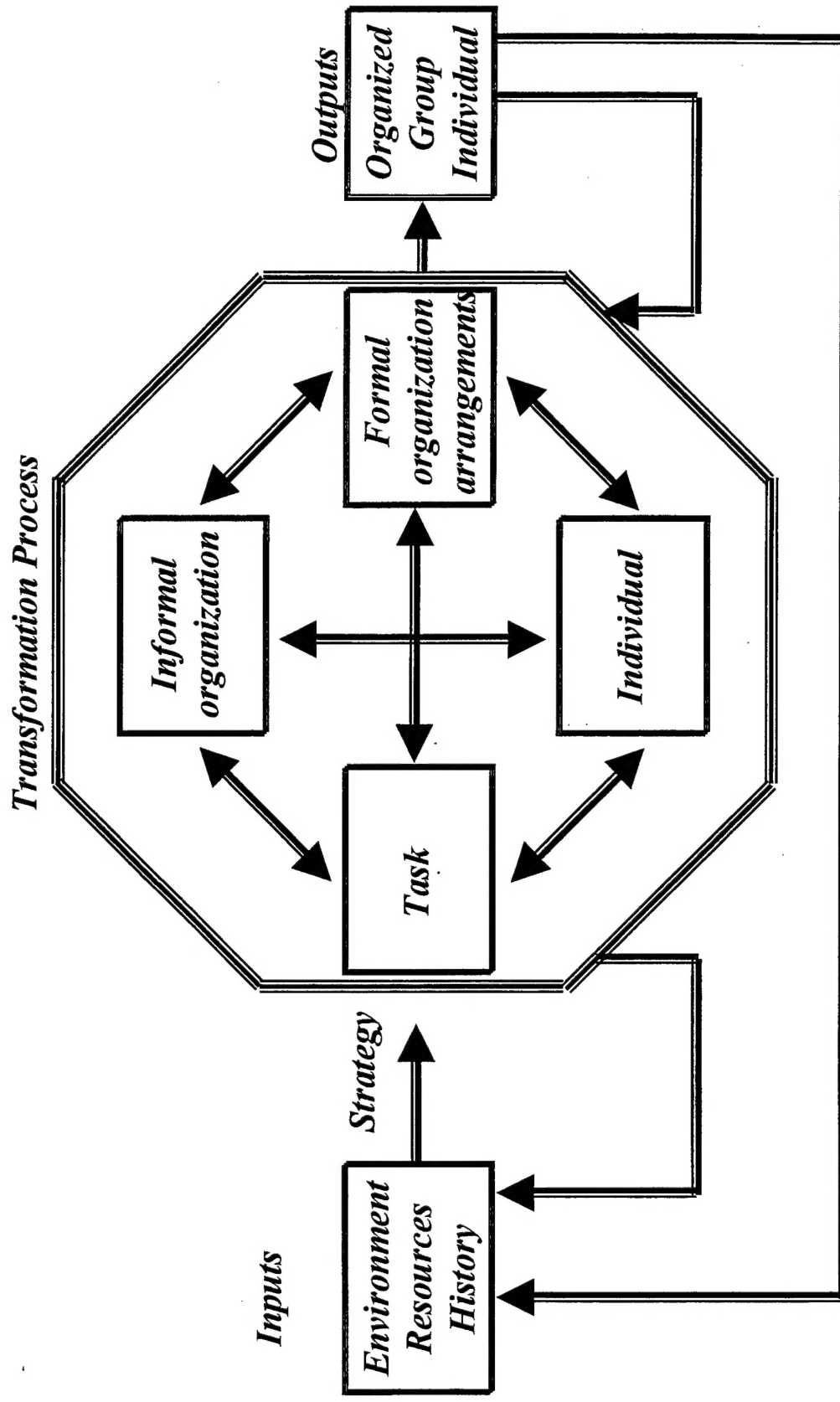
Clearly, all training and education should be subject to analysis of the variables that will influence their outcome; however, when instruction is combined with a novel technology, like NBI, such analyses become critical because the technology has unique effects on the learner, learner-instructor and learner-learner interaction, and the organization. Generally, educational systems designers or researchers focus their analysis on the individual and his or her reactions to the technology. These learner reactions will be influenced in part by the design of the instruction--its quality and fit with learner needs and expectations. However, training and education do not take place in a vacuum; in fact, they constitute an organizational intervention, particularly when an unproven technology like NBI provides the mode of delivery. Consequently, learner reactions will

also be influenced by the interaction of the training with the host of complex organizational systems variables such as incentives for going through the learning experience, and organizational support for using the new knowledge once the executive returns to the workplace. Therefore, analyses that examine the fit or the alignment between the learner, the instruction, the technology, and the organization must be conducted.

The complexity of organizational systems has long been recognized in the management literature. Nadler and Tushman (1980), for example, use a systems approach to develop their model of organizational effectiveness. The model includes inputs (environment, resources, history, and strategy); organizational components (task, individual, formal organizational arrangements, and informal organization); and outputs that include several measures of organizational effectiveness (see Figure 1). The researchers note the internal interdependence of organizational variables, that is, changes to one subpart or subsystem of an organization affect other parts. This interrelatedness of system and subsystem components causes Nadler and Tushman to hypothesize that "Other things being equal, the greater the total degree of congruence or fit between the various components, the more effective will be the organization..." (p. 243).

In terms of the Nadler and Tushman model (1980), training and education is part of the formal organization arrangement component that, among other components, includes systems for attracting, placing, developing and evaluating human resources. Consequently, both training and education are subject to the influence of countless organizational factors such as organizational reward systems, organizational control systems, and measures of organizational effectiveness. Despite the fact that training and education are influenced by other organizational systems and subsystems, a macro-level systems perspective is not common in the discipline of training and

Figure 1
A Congruence Model for Organization Analysis



Source: Nadler and Tushman (1980)

education. In the training world, most systems approaches are micro-level, focusing solely on the design and development of instruction. For example, the military requires the Instructional Systems Development (ISD) approach (Chief of Naval Education and Training, 1981), which is a five-phase process that includes analysis, design, development, implementation, and evaluation with opportunities for feedback built into many of the steps in each phase. In fact, as Goldstein (1993) notes, many have been disappointed because they assumed that a well-conceived instructional program was sufficient for success, yet many programs have failed due to organizational system constraints.

In particular, the Navy, despite many years of research, development, and implementation of instructional technologies, has experienced some notable failures due to lack of attention to the system in which the instruction was implemented. In one case, significant resources were invested to implement computer-managed instruction (CMI) for some Navy technical training courses, which trained thousands of students per year (Orlansky and String, 1981). The CMI was designed to provide administrative support for the school. For example, the system scored tests and directed students toward remediation or advanced instruction. The system was planned to free the instructor from work that a computer could do and create additional time for the instructor to conduct one-on-one problem diagnosis and tutoring. While the system was well conceived and designed, the implementation ultimately failed because it was too different from "the way business had always been done." In essence, the system designers did not account for the influence of people and the informal organizational system. Resistance coming from instructors and senior officers ultimately ended the effort and wasted innumerable resources.

This description of the CMI failure begs the questions: "Why wasn't resistance anticipated?"

Why, given all the research available on systems thinking and managing change, had there not been better planning and a more thoughtful implementation strategy developed that would have accounted for instructor and officer resistance and understood the organizational systems' factors that helped create that resistance? Perhaps systems designers believed that CMI technology benefits and uses were self-evident, that CMI users would interpret the new technology in the same way as the system designers had when they developed it. In essence, these designers did not recognize that, as Karl Weick (1990) has pointed out, all technologies are equivocal; users will interpret a technology in fundamentally different ways due to myriad organizational factors. Goldstein (1993) indirectly addresses this issue of systems factors causing multiple interpretations of the value and use of a technology through his discussion of the importance of needs analysis. He states, "Educators have been seduced by computer-assisted instruction...before they have determined the needs of their organization and the way techniques will meet those needs." (p.20)

PURPOSE

This research analyzes the NBI design characteristics and BUMED systems factors that should be assessed to develop effective NBI modules for Navy Medical Department executives. We strongly recommend that these NBI design characteristics should be analyzed initially during NBI design stages, and ultimately during beta testing. BUMED leadership should address the system factors to ensure that NBI implementation is handled strategically. Recommendations focus on those actions that NBI subject matter experts and systems designers can take to ensure that executives are fully engaged in the learning experience and that, as a result of that engagement, they complete the NBI courses; perceive them as valuable; and acquire knowledge, skills, and abilities that will contribute to enhanced job performance. The ultimate goal of this research is to

help prevent the NBI instructional effort from being just another technology "push" that ultimately fails due to inattention to the fit between the technology and the people, tasks, and organizational systems it serves.

NETWORK-BASED INSTRUCTION FOR NAVY MEDICAL EXECUTIVES

In the last five years, business computer users' familiarity with and use of networks has increased dramatically. Most business users rely on e-mail as an important communication media, conduct on-line searches using a variety of network browsers, and some even have their own home pages and use them as an important tool for information dissemination. What has spurred this rapid creation of a network culture is the increasing robustness of networks, user-friendly graphical interfaces, easy-to-use Internet search engines, low-cost but increasingly powerful processing chips, reduced cost of RAM, and a critical mass of businesses and service providers who aggressively market eye-grabbing Internet sites for information dissemination. Indeed, the perception has been created that if one doesn't "surf the web," one is disconnected from the pulse of modern life.

The myriad uses of networks for education and training have not escaped the attention of universities and businesses. For example, in Duke's Fuqua School of Business Global Executive MBA program, almost 90 percent of instruction is conducted over the Internet. Students, hard-charging executives who require a global perspective to remain competitive, meet during the 19-month program only four times, each on-site session lasting two weeks, at various places around the world. The College of Business Administration at the University of Tennessee, Knoxville is in its first year of an Executive Master's of Business Administration for physicians (PEMBA) offered through synchronous, interactive Internet classes. AT&T, one of the world's largest corporate

educators, is offering over 40 percent of its programs via the Internet. Other corporations claim they are aiming to place at least half of their training on the Internet by 2000 (www.aacsb.edu/publications/newsline/nlsp98a1).

The organizational advantages of Network Based Instruction are clear cut. NBI can enable large numbers of learners who are geographically dispersed to learn when they have the opportunity, at their own pace, and in their own homes or offices. Asynchronous learning is increasingly becoming the solution for busy managers and executives who cannot afford time away from the job for education. Senior naval medical executives are required by Congressional legislation to have graduate-level management education, but they cannot leave their jobs to enter resident education programs. As a result, the Naval Postgraduate School (NPS), in partnership with BUMED, is engaged in exploring methods for providing education to Medical Department personnel at their workplace.

Initially, the faculty at NPS experimented with conducting instruction at Navy clinics and hospitals, and subsequently conducted research into the use of video teleconferencing (Suchan and Crawford, 1995; Crawford and Suchan, 1996) to provide that instruction. However, changes in technology have been accompanied by changes in thinking at NPS and BUMED: the rapid expansion of NBI suggests it may be a timely and, perhaps, cost-effective technology to provide education for the BUMED EME program.

Despite potential advantages of NBI, it does create a significant challenge: can organizations create or purchase NBI courses or modules, let alone cost effective ones, that engage adult learners and add value to the organization? Although "engagement" seems like a simple concept, it actually captures a complex series of attitudinal and behavioral characteristics that

coalesce in the concepts of motivation and learning. In turn, the degree to which BUMED executives will be motivated to learn via NBI technology is dependent on a number of complex, interrelated organizational factors. This next section analyzes these complexities to create recommendations for NBI design and organizational implementation.

Before turning to the analysis, we first define more precisely learner engagement using Csikszentmihalyi's (1990) research on flow and optimal experience as a theoretical framework, which we then link to research on intrinsic motivation. This linkage allows us to tap a rich body of research on task characteristics and psychological states conducted within organizational contexts that we can apply to NBI design. Furthermore, this focus on contexts provides a connection to the factors within the BUMED organizational system that affect executives' engagement with the NBI modules and the EME program in general.

THEORETICAL BACKGROUND

Mihaly Csikszentmihalyi, in *Flow: The Psychology of Optimal Experience* (1990), defines flow as a participant-created psychological state resulting from the performance of an activity where concentration is so intense that non-task concerns are blocked, self-consciousness disappears so that fear of failure or the need to "look good" disappears, and time becomes distorted: the participant has entered a self-created micro-world that has a self-constructed reality. A task that helps or enables the participant to create this psychological state becomes so gratifying that the participant is willing to do the task for its own sake, with minimal concern about external rewards. In short, during states of flow the participant is completely engaged--mentally and psychically--in the activity (Csikszentmihalyi, p.71).

Csikszentmihalyi points out that activities or tasks can be designed to make them more

conducive to the mental engagement that characterizes flow, or that participants themselves can restructure their perception of the task to enable them to be engaged in the task: people who to outsiders may seem to be doing boring, repetitive tasks (for example working on an assembly line) may interpret their task in a manner that creates engagement and the flow experience.

Consequently, both external factors--the design of the task itself--and internal conditions, such as participants' perception and interpretation of the task, need to be accounted for to create tasks and an organizational climate or culture that contributes to task engagement and the condition of flow.

There are a number of design features characterizing tasks that can make it easier for workers to achieve engagement and flow. These tasks have clear-cut goals, rules that require the learning of new skills, mechanisms that provide participants with feedback about their learning and progress, and a design that enables participants to control the task activity within constraints implicit within the goals and rules. Similarly, there is a cognitive or mental design capability individuals must have to become engaged that parallels the task design features. To become engaged in a task and experience flow, individuals must have well-developed symbol systems that enable them to process and order new knowledge, well-defined personal goals that help them focus on the activity at hand, a desire for challenge and growth, and an openness to feedback both from the task and others that enable participants to chart their learning progress.

Interestingly, flow and intrinsic motivation are similarly defined. Furthermore, the specific task and mental/cognitive design features that Csikszentmihalyi claims are necessary to create task engagement and a state of flow are similar to the job design characteristics and psychological states that define intrinsic work motivation.

Generally, intrinsic motivation is defined as the positive experiences that individuals derive

from their work tasks that result in them being enervated, involved, and committed to their work (Thomas and Velthouse, 1990). Deming (1993) adds the emotion "joy of work" as a characteristic of intrinsic motivation. Similarly, flow activities result in enjoyable experiences, partially made possible by complete involvement and commitment to the activity itself. Clearly, both the concepts of flow and intrinsic motivation provide entree to understanding learner engagement.

In addition to similar definitions, there are similar activity or task design features that link flow with intrinsic motivation. Hackman and Oldham's job characteristics model (1976), perhaps one of the most widely used models of intrinsic motivation, examines the relationship between dimensions of job design, the psychological states these dimensions create (the moderating variables), and the personal and organizational outcomes that are produced--internal motivation, high job satisfaction, quality work, and so on. These researchers posit five core characteristics of job design that contribute to intrinsic motivation: skill variety, task identity (opportunity to complete an entire piece of work), task significance, autonomy, and feedback. Three of Hackman and Oldham's core job characteristics--task significance, autonomy, and feedback--match Csikszentmihalyi's activity design features that help generate the possibility of engagement and flow.

The work of both Hackman and Oldham and Csikszentmihalyi is crucial to NBI course/module designers and subject matter experts. Their research implies that the NBI learning tasks--the interplay of module course content and the technology that provides that content--must demonstrate certain design or structural characteristics if learners are to be engaged in the task and, hence, deeply learn. Later sections of this report will specifically relate these design features to NBI EME modules.

Hackman and Oldham also identify the critical psychological states that are shaped or generated by task design, which ultimately lead to high internal work motivation. They claim that perceptions of task meaningfulness, responsibility for results, and knowledge of results contribute to intrinsic motivation. However, researchers assessing the Hackman and Oldham model have found the model's psychological states incomplete and in need of revision or expansion.

Thomas and Tymon (1997), building on the work of Hackman and Oldham (1976) and Deci and Ryan (1985), add individuals' perceptions of choice, feelings of competence, and sense of progress to the previously mentioned psychological components of intrinsic motivation. Perceptions of choice occur when individuals feel they can select tasks they wish to perform and, just as importantly, use their judgment in determining how to perform those tasks. Feelings of competence result from the perception that one is skillfully performing the task. Progress is perceived when one feels that he/she is moving forward, coming close to achieving the tasks' ultimate objective. In the Thomas and Tymon model, Hackman and Oldham's concept of meaningfulness is retained, but knowledge of results becomes embedded in perceptions of competence and progress through the concept of positive feedback. Hackman and Oldham's responsibility for outcomes is left out of the Thomas and Tymon model since this variable is linked with autonomy, which leads directly to perceptions of choice. Consequently, Thomas and Tymon's integrative model provides four psychological components that people must feel to be intrinsically motivated: a sense of choice, competence, meaningfulness, and progress.

Csikszentmihalyi uses the broad-based concept of the "autotelic self," which has self-contained goals, to capture the psychological characteristics that define flow. Embedded within this concept of the autotelic self are the concepts of meaningfulness, choice, competence, and progress.

Individuals whose goals originate from the self rather than from social conventions, peer pressure, randomness, or biological need have the awareness that they are choosing the goals they are pursuing. Furthermore, this awareness of choice and the sense of ownership in the goal decision, result in goal choices that are meaningful to the person and, if in a work environment, hopefully to the organization.

Csikszentmihalyi also links the autotelic self's choice of a meaningful goal with the self's recognition of challenge and the system of actions necessary to meet that challenge. He argues that systems of action imply skills; and to develop skills, learners must pay attention to the results of their actions--in short to monitor feedback. Without careful attention to feedback, individuals become disconnected from the results or consequences of action and hence will not be able to determine if they are making progress toward reaching the self-chosen learning goal. In essence, feedback enables learners to determine if they have competently mastered the necessary skills, and to monitor the progress they are making toward achieving their goals.

As we have seen, embedded within the psychological makeup of the autotelic self are intrinsic task rewards similar to those proposed by Thomas and Tymon. However, Csikszentmihalyi's use of this concept also includes the concepts of engagement (task immersion) and concentration, which are absent in intrinsic motivation models. The capability of choosing actions to reach meaningful goals initially causes people to become deeply engaged in the work they're doing. Maintaining this engagement requires a tension between one's ability to act or think skillfully and the skill demands of the task. More specifically, the perception of the gap between one's current skill or knowledge level and that required to reach a goal or subgoal must be great enough to sustain interest but not so large as to appear overwhelming. The task should stretch a

person's capability so that growth and new learning occurs, but not overwhelm the person so that frustration, despair, and even boredom set in. Furthermore, this engagement can only be maintained by constant inputs of attention or psychic energy. The sources of this psychic energy originate from continual belief that the task is meaningful, that learners have control over their activities, and that feedback indicates the person is developing competence (learning) and making progress toward subgoals and goals.

To summarize, we have presented the theoretical underpinnings of the concept of engagement. Flow is the general psychological state that characterizes people being engaged--physically and mentally--in a task. For this engagement to occur, the task must have specific design features that lead to activities causing the executive to perceive that the task is meaningful, and that he/she is competent, making progress, and has choices or control of the task situation. These perceptions stem from the task design and resulting activities, but also from the broader organizational context in which the task is embedded. For example, if most aspects of the BUMED organizational system--its people, culture, reward, structure, and control and measurement systems--do not reinforce the purpose and importance of the BUMED EME program--then it becomes difficult for EME NBI participants to create the psychological state resulting in intrinsic motivation. In fact, if there is not clear organizational support for the goals of NBI instruction, cynicism may set in: the program becomes another block to check in a series of externally imposed, somewhat meaningless requirements. Next, we describe the specific factors in the BUMED organization that should be considered.

ANALYSIS OF THE ORGANIZATIONAL SYSTEM

As noted earlier, a systems perspective of organizations assesses the system of interrelated organizational elements in which a change in one element affects other elements. The Nadler and Tushman (1980) model of organizations discusses systems inputs, components, and outputs. The model emphasizes the interaction of organizational components and their states of relative "fit," or congruence, with each other. Specific organizational components delineated in this systems model are task, individual, formal organizational arrangements, and informal organization. An example of fit between two of these components is the congruence between task demands and individual capabilities, or task demands and individual expectations. Thus, a task might be appropriate and necessary, but the output (for example, productivity) might be poor if individuals are unable or unwilling to perform the task due to a variety of reasons such as poor training, inadequate rewards, or poor job design. As Nadler and Tushman point out, "The different parts of an organization can fit well together and function effectively, or fit poorly and lead to problems dysfunctions, or performance below potential." (P. 237)

For this research, we are interested in the organizational system that exists within, and surrounds, the management education experience of BUMED executives. Of importance here are the factors relating to the knowledge, background, and expectancies of EME students; the formal organizational arrangements such as structure and reward systems that affect EME participants' perceptions of the program; the informal organization, involving organizational culture, leadership, and communications; and the task factors, that is the design features of the task, in this case the NBI medium and module content. Each of these components needs to be analyzed to ensure favorable outputs for NBI instruction and the EME program. In fact, it becomes difficult to

separate analysis of a technological intervention such as NBI from analysis of the larger EME program of which it is a part. We next address each of the components within the BUMED EME organizational system.

Individuals

The characteristics of the BUMED executive learners can influence the success of NBI implementation and the EME program. This highly educated professional group brings not only significant knowledge but, more importantly, numerous expectations of how and what they should learn.

Given the high cost and easy accessibility of NBI learning, there is a possibility that BUMED and other Navy commands may enroll learners in modules that were designed for a narrow target audience. Consequently, determining who will be NBI module users and their background knowledge about the topic is crucial before NBI development. For example, NBI modules with content that is too complex or simple and examples pitched at the inappropriate organizational level will frustrate learners, resulting in a flood of e-mail to the instructor to further clarify module concepts, inordinate time to complete the module, or even non-completion of the module, and negative perceptions of NBI. Obviously, it is difficult for an officer to perceive a module as meaningful and be fully engaged in the learning if module subject matter, examples, and learning processes are inappropriate for that officer.

NPS conducted an extensive needs assessment to determine appropriate content for the EME program. That content, though, has since been reviewed and revised by a Tri-service working group. Furthermore, there are subject matter experts linked with the modules, many of whom participated in the needs assessment but did not participate in the Tri-service review. As a result of

the NPS needs assessment, modules were originally designed with particular target audiences in mind: there was a set of modules designed for senior department heads and new directors, another set for senior directors and officers screened for Executive Officer (XO) and Commanding Officer (CO), and a final set for current XOs and COs. The concept of "just-in-time education" drove this targeting of specific modules for specific groups. Nonetheless, when modules were delivered at Military Treatment Facilities (MTFs), officers attending the modules did not match the target audience for whom the modules were designed. For example, modules targeted for senior department heads and new directors were attended by Ensigns and young Lieutenants as well as senior Captains. Consequently, the module content, the examples, and even the pedagogies (learning processes) were not appropriate for a segment of learners. This problem was partially overcome by instructors, often on-the-spot, modifying content, examples, and instructional approaches to meet the needs of this new learner mix.

Obviously, NBI doesn't easily lend itself to these types of modifications. Even relatively simple changes in NBI content can be expensive and time consuming if various forms of multimedia (e.g., voice and video clips, complex supporting graphics) are used to communicate learning points.

Recommendation

- Determine beforehand if a NBI module will be targeted for all EME participants or for a segment of that population--senior department heads considering the move to executive medicine, officers screened for XO and CO billets, or current XOs and COs. For a number of EME modules, this targeting will affect content, examples, level of complexity, and a number of

other instructional factors.

Formal Organizational Arrangements

Additional influences on perceptions of NBI task meaningfulness and significance, thus contributing to learner engagement, are the various formal organizational arrangements that commands make in the form of institutional support for NBI learning. Nadler and Tushman (1980) define this component as, "The various structures, processes, methods, and so on that are formally created to get individuals to perform tasks." (P. 241). Institutional support has symbolic as well as practical value; it tells executives that the organization believes NBI learning is important.

Recommendations

- Provide time off for NBI work and publicize this fact throughout the command. If participants have to find time "out of hide" to complete NBI modules, officers will quickly give EME NBI learning low priority and thus not expend the maximum intellectual effort to master module content.
- Implement control and reward systems. If officers are to believe that BUMED values their NBI participation, then NBI module completion needs to be carefully tracked and even, if appropriate, noted in their Fitness Reports. If NBI learning is not recognized through control systems and rewards, executives will participate in other activities that are monitored and reinforced.
- Provide appropriate technology and training to use that technology. To take advantage of the full spectrum of NBI instructional capabilities, executives need sufficiently powerful computers to quickly download from the module

Web site the video and sound clips used for instruction. Furthermore, they may need training or technical support to make system configuration changes to download graphics and various instructional support enhancements. Some universities are finding that instruction designed to exploit Web-based technology did not take student computer access into consideration. Specifically, computers with low-powered micro-processors and insufficient RAM may take an inordinate amount of time to download video clips, which result in user frustration. Additionally, the networks these computers are linked with must be sufficiently robust to ensure that connections to the Web site can be made quickly, and once the connection is made it will not be dropped. BUMED needs to be coordinating with IDEA and the contractors and subcontractors developing NBI courseware to ensure that it can easily run on the computers and networks that the typical Military Treatment Facility or clinic possesses.

- Provide technological support in the form of easy access to someone tasked with the responsibility for dealing with technical problems. Executives should not be expected to put forth much effort to solve technical problems, and it seems intuitively obvious that they will not tolerate excessive difficulties with the technology.

Informal Organization

Nadler and Tushman (1980) point out the coexistence of the informal organization with formal organizational arrangements including leader behavior, intragroup and intergroup relations,

informal working arrangements, and communications and influence patterns. One construct that effectively addresses several of the variables within this component is organizational culture. The powerful influence that organizational culture exerts on organizational outcomes is well known (Martin, 1993; McCaskey, 1979). Even with all other organizational components properly aligned, the norms and values of the people in an organization can either enhance or detract from planned outcomes such as increased commitment, improved productivity, and individual satisfaction. The same holds true for learning experiences; previous learning experiences create norms and expectations that students bring with them to new learning situations.

From previous EME instructional experience with BUMED executives, we determined that an important part--perhaps the most important part--of traditional classroom learning experiences for executives is the opportunity to come together to collaborate in information sharing and problem solving both in class and "Off line" after the class. These executives expect collaboration as part of the learning experience. In fact, we have observed that the learner-learner interaction often generates the most useful new knowledge for BUMED executives.

The degradation of traditional face-to-face collaborative opportunities that will occur after NBI implementation may prove a major source of resistance to this new form of instruction, particularly from senior officers who may not be computer or technologically savvy. Various forms of extrinsic motivation may be necessary to minimize that resistance before these officers will be able to perceive carefully designed NBI modules as intrinsically motivating. Distance learning research shows that student willingness to tolerate the changes posed by technology-mediated instruction--compared to face-to-face learning--is a function of perceived need for the learning experience (Suchan and Crawford, 1995). If students recognize, for whatever reason, that they

must have a certain education or training experience and distance learning is the most convenient means to gain that experience, they report considerably more satisfaction with the experience compared to students who don't perceive the same pressing need for the education and training and have other instructional choices readily available. Results from scores of reports and journal articles we reviewed conclude that, when given the choice, students always prefer traditional instruction. The research further suggests that students become more comfortable with technology-mediated instruction with continued exposure to it.

Informal organizational systems are also influenced by leadership communications. The manner in which BUMED leaders initially frame and support NBI will significantly influence officers' perceptions of current and future NBI modules and other attempts BUMED may make to provide NBI training. That framing may also decrease senior officer resistance to NBI.

In all likelihood, EME participants will have limited experience with NBI. This lack of understanding will cause uncertainty and ambiguity about NBI. BUMED leaders' effectiveness lies in their ability to make activity, particularly when it may be new and perhaps threatening, meaningful for others, and to provide others with a deep understanding of the organizational significance of their activity (Pondy, 1978). They can do this through the process of framing.

Framing is an action tool and strategy designed to order organizational experience for its members. Frames help shape how organizational members see, interpret, and talk about organizational events and help steer thought and action in a particular manner. In short, framing can control meaning and perceptions of meaningfulness. Consequently, BUMED leaders have the opportunity to frame the NBI experience for its participants, and thus lay the groundwork for perceptions of meaningfulness that are essential if learners are to be engaged in NBI learning.

Framing is accomplished through strategic acts of communication. Listed below are several strategies that could be used to monitor culture and frame the NBI experience for its members so that there is greater possibility of perceived meaningfulness.

Recommendations

- Address student resistance based on historical preference and organizational culture in beta testing and program evaluation. Program evaluation should be conducted at several points in time to account for the effects of exposure to the medium.
- Use a qualitative methodology, i.e., interviews, to capture factors that might not be anticipated by instructional designers. Careful attention to executive perceptions of the NBI learning experience will reveal actions that can be taken to improve learning processes and enhance learner engagement.
- Publish articles in BUMED house organs describing NBI, indicating its role in EME education, stating BUMED's goals for its use, and publicizing NBI successes in other organizations.
- Conduct briefings at the MTF Commanders' Conferences describing NBI and indicating its value and its planned use.
- Provide highly Interactive NBI demonstrations at flag meetings and BUMED conferences to further reinforce the purpose and uses of this technology.
- Provide NBI demonstrations on the BUMED Web site.
- Develop high-visibility NBI EME champions who continue the conversation about NBI at the field level and the BUMED organizational level.

- Promulgate information about NBI on Web pages through mass distributed e-mail messages, and other electronic means.

In essence, the process of framing makes the NBI goals public, and is the starting point for creating a distance learning culture where the perception is created that instructional technologies like NBI are important to the BUMED organization and that they are essential if BUMED is to achieve its training and educational goals. Timing is essential to successful framing. This activity should not occur until the EME program is ready to launch several beta-tested NBI modules and has several more modules in the advanced development stage.

INSTRUCTIONAL TASK DESIGN FACTORS

For a learner to become engaged in a specific NBI module, the module content and the courseware must be aligned with or complement the learner's psychological and learning needs and the behaviors that result from the relative degree those needs are met. In this next section, we draw on our previous conceptual discussion of flow, intrinsic motivation, and task design to discuss the psychological states that enable learners to be engaged in the learning material, the behaviors that result from those states, and the characteristics of NBI module courseware that can help create these states.

Perceived Meaningfulness

For a learner to commit to a specific NBI module, that learner must perceive the module as personally and organizationally meaningful. Specifically, learners must believe that they are not merely going through the motions to fulfill a BUMED requirement, that completing the module is a worthwhile, valuable task to pursue, and that the learning gained from its completion matters in the larger context of one's personal development and the organization's development. As we

discussed in the previous section on formal and informal organizational arrangements, the organization also has responsibility for helping the learner to perceive the organizational meaningfulness of NBI instruction.

What helps generate this perception of meaningfulness, and thus the willingness to invest and focus psychological energy on the learning task, is the learners' understanding of and belief in the importance of the task or learning goals. Locke, Latham, and Erz (1988) point out that goals are the most powerful determinants of behavior. Goals can direct attention, encourage persistence, and, depending on how the learning task is structured, focus learners' attention on developing strategies to achieve those goals. In short, goals frame the learning task by providing constraints, or, in the broadest sense of the word, a design or structure for the learning activity. Goals, in this context, refer to the broad purpose for the instruction. An important related concept is specific instructional objectives, which are addressed following the discussion of goals.

Locke, Latham, and Erz also indicate that the source of goals (were they assigned by other, e.g., supervisor, instructor, the bureaucracy, or did the employee participate in goal formation) affects commitment and, hence, self-regulation and persistence--both of which contribute to learner engagement. Not surprisingly, employees who participate in goal formation are generally more committed to reaching those goals and are more likely to report feelings of flow or engagement.

This issue of goal source is important to NBI subject matter experts, instructional designers, and facilitators who may monitor chat rooms or list servers because BUMED participants may initially perceive that they have had little say in developing module purpose and goals, that those determinations were made by the BUMED or Tri-Care bureaucracy. That perception can be countered by linking module goals with the BUMED needs assessment: the BUMED officer corps'

inputs strongly influenced module goals.

This relationship between perceived meaningfulness, commitment (investment of psychic energy), and goals has practical implications for NBI design. NBI module goals must be clearly articulated to BUMED officers. More specifically, the NBI modules should have specific structural characteristics. Not only will these characteristics increase perceived meaningfulness, but they will also create natural breaks that enable learners to easily exit and re-enter modules if learners are unable to complete them in one session.

Specific instructional objectives may be derived from goals. Four different categories of objectives may be considered:

1. Reaction objectives describe attitudes toward the education or training experience.
2. Learning objectives address the knowledge, skills, and abilities (KSAs) that the learner is expected to acquire and how they will be demonstrated.
3. Transfer objectives describe the changes in job behavior that should occur as a result of transferring KSAs from training/education to the job.
4. Organizational outcome objectives make explicit the benefits that will be obtained from the changes in job behavior brought about by the learning experience.

A training or educational program should develop objectives in all four categories (Blanchard and Thacker, 1999).

Clear, well-written objectives benefit the learner, the instructional design, and the evaluation process. Objectives let the learner know exactly what is expected at the end of the instruction, reduce stress, focus attention, and cognitively organize new information (Blanchard and Thacker, 1999). Objectives should be referred to throughout the learning process. Further,

since objectives define behaviors expected from the learning, they should be used to define all evaluation measures.

Recommendations

- Create goals that show a clear indication of the module's purpose: a statement or series of statements that define the personal and organizational value of the module.
- Create clear instructional objectives, of all four types of objectives, that define the module learning end states from a personal and organizational perspective.
- Ensure that instructional objectives are reflected in all evaluation measures.
- Develop an overview of topics to be covered to further provide learning constraints.
- Design advance organizers of concepts within each major topic area.
- Implement constant summaries that rearticulate module purpose and goals to help learners keep in mind the module's big picture, thus contributing to learner persistence.
- Explicitly indicate the influence Medical Department executives had on module content. The role that these executives had in developing module content could be articulated at the outset of the NBI module when purpose and goals are first introduced.
- Contextualize these structural characteristics; they must be described in BUMED language with BUMED examples to help further trigger perceptions of module significance and, hence, meaningfulness for learners.

Perceptions of Choice

The construct of choice refers to people's perception that they have control over their behavior, that they can determine how job tasks ought to be done, and that they are not a pawn overly controlled by others' rules and procedures. This notion of choice is similar to perceptions of autonomy and self-determined behavior. As Deci and Ryan (1985) point out, individuals who feel they can determine how to perform an activity, are more likely to enjoy that activity for its own sake and that enjoyment enables them to be lost in their interaction with that activity. Specifically, Csikszentmihalyi (1990) describes the intense concentration and focus of surgeons who are completely involved in their task not only because of its inherent meaningfulness but also because they have control or choice over how the surgery proceeds.

Adult learning research also echoes the importance of choice. Savery and Duffy (1995) state that adults generally learn more deeply and permanently with instructional approaches that give them opportunity to use their own initiative and to direct and control their learning. Indeed, a recurring theme in the learning literature is the transition from instructor-centered to learner-centered instructional approaches that focus on strategies that enable learners to take control of their learning.

NBI instruction has varying elements of control and choice. Unlike the traditional face-to-face classroom, NBI learners can decide when and where "to take" the module and can complete the module at their own pace. In short, time and location are in control of learners rather than institutions. Furthermore, learners can revisit earlier module sections to better familiarize themselves with module content. Asynchronous learning clearly provides learners with a degree of autonomy that face-to-face instruction does not.

On the other hand, for NBI instruction to be cost effective, reliable, and consistent, modules must be standardized and thus be able to be duplicated at a large number of remote locations. At an extreme, these constraints may cause the "automating" of instruction, particularly for lower-level learning outcomes where instructional processes may be very structured and routine (e.g., a NBI module designed to teach basic financial management concepts may become no more than a computer page turner). This need for some degree of standardization freezes module content until the module is redesigned.

To determine module content, NBI instructional design may focus almost exclusively on inputs from subject matter experts who, theoretically, house all necessary knowledge about the subject rather than the ongoing input of learners and instructors who collectively shape and reshape instructional content and processes. The instructional product that results from this NBI process may be largely instructor directed and thus seem to be engineered rather than artfully created.

The possibility exists that NBI modules focused on the subject-matter-expert may be overly guided to ensure that learners reach the predefined goals built into the system; at worst, a NBI module may lead learners on a kind of forced march through the material, moving inexorably from screen to screen with minimal choice about learning content and process, the on-screen equivalent of a lecture. This self-contained NBI learning world may be perceived as overly restrictive or claustrophobic to learners who expect to have some choice or self-direction in how and what they learn, particularly given their prior experiences in face-to-face instructional settings. Indicators of perceptions of limited choice and over regulation may be the frequency that learners exit the module before completion. This piecemeal approach indicates limited learner engagement with the module and suggests that external factors, that is, the BUMED reward and punishment system,

rather than intrinsic factors (e.g., interest in the learning task) are motivating the officer to complete the module.

Whether this perception of limited choice undermines learner engagement may depend on the module's learning outcomes. Lower-level outcomes such as knowledge of facts, principles, concepts, and structured decision procedures and processes require learners to depend on instructors' knowledge. Learners appear to recognize and accept this decrease in choice and loss of autonomy; novice or apprentice learners will give up self-direction until they have stored a reservoir of knowledge and skills that enable them to make intelligence choices. Consequently, modules like "Budgeting for Health Defense" and "Financial Reporting," which are designed to provide officers with basic knowledge in these areas, may lend themselves to approaches that are subject-matter-expert directed. However, in modules where learners have prior knowledge about the subject, and the learning outcomes require instructional techniques that generate interaction (for example, "Leadership and Motivation" and "Conflict Management and Negotiation") and the construction of knowledge valuable to BUMED learners through that interaction, NBI module design needs to support significant learner choice. Specifically, the design should address prior student knowledge to pursue module learning goals, and the means of sharing that knowledge and debating its value with other learners to create new learning.

Providing learners with autonomy or choice on how to reach learning goals can be a challenge in the NBI environment. Provided below are several suggestions that can balance the need for learner choice and autonomy with the content structure constraints needed to duplicate the module asynchronously at different sites. This balance will change depending on the module's learning outcomes and the degree of autonomy or learner choice built into the pedagogies (case

discussion, simulation, etc.) used to reach those outcomes.

Recommendations

- Provide learners with significant control over the sequencing of module information, including the capability to review, go to remediation, or skip to advanced concepts. Executives will not require the same exposure to module material, nor will they have the same background level of knowledge even if a careful needs assessment has been done prior to NBI module development.
- Create hot links (hypermedia) to other Web sites and create loosely structured assignments that encourage learners to search for additional information about a module topic. This process enables learners to create their own knowledge structures.
- Monitor and feedback learners' choice of information search strategies so that they become more aware of the search patterns and structures they use. Provide alternative or model hypermedia search strategies so that learners can develop strategic hypermedia search routines.
- Use open-ended questions based on readings, scenarios, or video role plays and instructor-facilitated chat rooms or list servers to generate responses to those questions. Encourage executive to share their own and respond to others' experiences in these electronic venues. This electronic dialogue could enhance peer learning in ways not possible by interaction with NBI content alone.
- Provide an ongoing venue for executives to make suggestions for improving

the NBI experience.

- Provide immediate and direct access to a "real" instructor for problems and feedback on the program.
- Use hybrid forms of distance learning media when possible. For example, schedule an interactive, get acquainted session via Video teleconference (VTC) before NBI learning begins. This richer media will provide visual and auditory information (e.g., link electronic messages with a face and a voice) that should enhance learner comfort level, hence quality, of future electronic communications.
- Provide learners with access to educator-developed databases or to external databases to develop and analyze alternatives to on-line cases; learners should have the choice of constructing new knowledge from existing information sources.

These suggestions will help shift focus from the instructor/subject-matter expert as being the primary creator of knowledge, and hence controller or director of learning, to students becoming an essential part of the knowledge-creation process. This shift provides learners with significant choice about how they learn and what they learn, depending on the extent to which they contribute to the knowledge creation process. Consequently, linked with increased learner choice is increased learner responsibility and ownership of the process.

Perceptions of Challenge

As noted earlier, Csikszentmihalyi (1990) points out the importance of challenge for task engagement, which is based on the perception of the gap between one's current skill or knowledge

level and that required to reach a goal. To stretch a person to the point where growth and new learning occur, the design of BUMED EME modules must address the fact that there should be a gap that is sufficient to sustain interest, but not so big that it is overwhelming. As the learner develops a system of actions necessary to meet the challenge, he/or she will be heavily dependent upon appropriate feedback, which is discussed further in the next section.

Challenge will be, in part, addressed by the recommendation made earlier to target the correct audience; that is, to match the module content with a specific group of learners. A group of NBI learners that includes personnel from multiple organizational levels will leave some learners bored with material they already know, and others frustrated with their lack of understanding.

Recommendations

- Create branching strategies, to the extent possible, within modules that will allow learners to skip through material or seek remediation. Each module could begin with an on-line test that would move a learner through the early stages of the lesson content if he/she could demonstrate knowledge of the concepts, or possibly validate the executive from the entire module.
- Conduct a careful review of the training and education histories of executives who will be required to complete the EME program. Executives who have already had the course in some other venue should be allowed to validate.

Perceptions of Competence and Progress

What helps individuals remain engaged in tasks, and to be persistent when faced with obstacles, is the perception that they are making progress toward achieving the task's purpose and goals. To feel that one is making progress, a person also must perceive that he or she is performing

competently, skillfully, or at least capably. These perceptions of competence and progress are generated through various forms of feedback.

Feedback is, in essence, interactivity. Feedback may result from interaction with the task itself--for example, the functionality of a knee joint provides surgeons with feedback about the success of the surgery--or from interactions with others (often superiors). Lack of feedback, particularly for new or relatively difficult tasks, can cause learners to flounder, losing confidence that they are progressing toward achieving their goals and developing new skills and capabilities. Consequently, in the NBI environment feedback must be conscientiously built into the design of the modules, and careful thought must be given to the kind and timing of feedback learners receive. Furthermore, the type and tone of the feedback should match the feedback norms of the BUMED community.

Feedback that spurs learner involvement depends on several factors: the relative degree of mastery learners have of the task at the time feedback is provided, the type of learning processes that are occurring, the orientation of the feedback (appreciative or controlling), and the individual's relative degree of ego or task orientation. Nicholls and Miller (1984) have observed that learners who are task oriented assess their performance based on improvements in personal mastery; these learners focus on the task rather than the self and see a positive relationship between effort or engagement in the task and personal mastery. In contrast, learners who have an ego orientation seek to demonstrate their ability by performing a task better than others. These learners are less interested in the learning task than in how well they are performing the task relative to others.

Lepper (1985) has noted that certain forms of feedback exert different effects on learner task interest and engagement. Feedback that focuses on informing learners of their progress

increases perceptions of developing subject matter mastery, and thus spurs continued involvement in the task. This type of feedback is particularly appropriate for learners who are task oriented. Normative feedback (how well someone is learning the task compared to others) can provide learners with motivation to continually demonstrate their competence. This type of feedback helps ego or performance-oriented learners to remain engaged in the task by measuring their competency and progress compared to others.

Kanfer (1990) points out that progress feedback is useful with learners in the early phases of skill acquisition or with learners likely to perform more poorly than others. Normative feedback is useful during later phases of skill acquisition when learners have developed a more resilient, less fragile, perception of subject matter mastery. In fact, normative feedback provided before a learner has developed a sense of competence can significantly reduce interest or engagement in the task and thus undermine learning. In short, learners may have the perception that they are not matching up well against the competition or that learning is merely a competitive game. These findings have practical implications for NBI module design.

Recommendations

- Provide carefully timed, ongoing feedback on progress toward achieving module goals for modules designed to provide officers with new knowledge (e.g., "Accounting," "Contracting," and "Budgeting"). Normative performance feedback (comparisons with other learners) should be avoided or provided during later stages of the module after officers have developed some mastery of the material to be learned.
- Provide normative feedback only in modules where officers already perceive

some degree of mastery (e.g., some communication and management modules).

- Vary feedback style based on module learning outcomes. For example, provide evaluative feedback for modules focusing on lower level learning outcomes--knowing and supplying information and applying information within structured situations. For modules focusing on higher-level learning outcomes--exercising judgment in the face of uncertainty, for example--consider coaching (open-ended questions that spur learners to grapple with issues) and educative feedback rather than evaluative feedback.
- Use positive language to frame all types of electronic feedback. Harackiewicz and Larson (1986) found that individuals' perceptions of competence were highest when the feedback contained specific, positive information about gains toward task completion rather than negative, critical comments. And Ryan, Mims, and Koestner (1983) showed that positive performance feedback increased task interest compared to no feedback. Negative comments were perceived as controlling and as a means of undermining the individual's choice in how to complete the task. Positively framed feedback is particularly essential in electronic environments where means for rectifying misinterpretations of the tone or intent of the feedback--non-verbal cues and immediate response--are missing.

PREFACE

This report is the third in a series examining factors that influence successful use and implementation of distance learning technologies. Sponsored by the Navy Bureau of Medicine and Surgery (BUMED), this research stream focuses on challenges that instructors, learners, and the BUMED and Naval Postgraduate School organizations face in transforming traditional face-to-face instruction to either videoteleducation (VTE) or network-based Instruction (NBI).

The first report, "Understanding Videoteleducation: An Overview," assesses the distance learning and VTE literature to determine factors Navy health care executives, administrators, and instructors should consider before implementing VTE as an instructional delivery mode. This report also provides a conceptual scheme of VTE use based on administrators' and instructors' mental models of learning. This scheme examines how these models influence administrators' and instructors' conceptualization of VTE technology; VTE design, support, training, and rewards; VTE measures of effectiveness; and the implicit and explicit rules that evolve about VTE use.

The second report, "Media Selection in Graduation Education for Navy Medical Officers," analyzes the complex relationship among learning outcomes, the instructional strategies required to reach those outcomes, and the capabilities--the relative degree of "richness"-- of various distance learning media to support those strategies. Distance learning media selection guidelines are generated based on analysis of module goals, instructional techniques, and stability of module content for 32 modules in the BUMED Executive Management Education (EME) program.

The report that follows, "Factors that Create Learner Engagement in Network-Based Instruction," focuses on the psychological states that NBI design must help create to enhance learning. Using systems theory and research in job design, peak performance, intrinsic motivation,

and learning theory, this research examines how the BUMED organizational system and the design characteristics of NBI modules can help health care executives generate a psychological state called cognitive engagement or flow. This state is characterized by learners' perception that their activities are meaningful and that they can control them. As a result, they become immersed in their learning, energized by the learning activities and the feedback they receive, and committed to future learning.

NBI is the newest and undoubtedly the most difficult and costly form of distance learning technology to implement successfully. Consequently, longitudinal beta testing should be conducted on NBI EME modules that represent different categories of learning outcomes. The organizational systems and NBI design factors analyzed in this study should serve as essential criteria for use in that beta testing.

FINAL OBSERVATIONS

Senior organizational leaders tend to view new technologies as self-evident artifacts whose value and use are transparent. We view that perception as a significant roadblock to effectively designing and implementing a new instructional technology like NBI. As we have pointed out, a new instructional technology like NBI is embedded in a distinct organizational system. The complexity of that system, and the novelty and intricacy of the technology in developing effective learning events, create unique challenges for senior leaders, subject matter experts, and instructional design teams. For NBI learning to be effective, the various elements of the organizational system must complement or be aligned with the task and structural characteristics of the NBI modules.

Initially, it may appear that we have defined NBI effectiveness from the learner's rather than the organization's perspective. We have focused on factors that can cognitively engage learners in NBI tasks and create a condition that Csikszentmihalyi (1990) describes as flow: a psychological state where learners perceive that their actions are meaningful, that they can control them, and, as a result, they become immersed in their learning, energized by the learning activities and the feedback they receive, and committed to future learning. However, as we have pointed out, the characteristics of engagement are closely linked with factors that lead to intrinsic motivation. Researchers have convincingly demonstrated that high intrinsic task motivation leads to improved organizational effectiveness. Consequently, our focus on learner engagement as a measure of NBI effectiveness should also result in improved organizational effectiveness, assuming that NBI module learning goals are linked with important BUMED administrative job tasks.

The creation of learner engagement is influenced both by the BUMED organizational

environment and NBI instructional task design factors. Using Nadler and Tushman's (1980) systems model to capture the systems variables that define an organizational environment, we have provided senior executives with specific recommendations to help ensure that NBI participant selection; formal organizational arrangements such as reward, control, and technical support systems; and the informal organization in the form of culture and leadership are aligned to support NBI learning. Furthermore, we have recommended NBI instructional task design characteristics that can create in learners perceptions of meaningfulness, competence, choice, and challenge--all of which can lead to learner engagement in NBI tasks. Our list of NBI design recommendations is general rather than detailed and exhaustive because module learning outcomes, the instructional strategies to achieve those outcomes, and the type and amount of interactivity needed to implement those strategies will affect significantly NBI task design features needed to generate engagement.

Finally, we strongly recommend that longitudinal beta testing be conducted on NBI modules representing different categories of learning outcomes. Furthermore, both quantitative and qualitative (e.g., interviews and perhaps talk-aloud protocols) data gathering methods should be used so that substantive changes could be made, if needed, in NBI design and BUMED organizational support. This study provides essential criteria--both organizational and instructional--that can be used in beta testing.

Organizational leaders and technical systems designers have significance influence on the perception and form of new learning technologies. How that influence is played out in organizational support for learners' use of that technology and its design and structural features will determine whether learners become engaged in NBI learning tasks or merely view NBI module completion as another check in the career progression box. This research suggests ways to generate

that learner engagement; the cost of NBI design makes clear that any other perception of NBI technology should be unacceptable to BUMED senior leadership.

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